



**CITY OF LODI
COUNCIL COMMUNICATION**

AGENDA TITLE: Approve specifications and authorize advertisement for bids for polemount and padmount transformers (EUD)

MEETING DATE: August 2, 2006

PREPARED BY: Electric Utility Director

RECOMMENDED ACTION: That the City Council approve the attached specifications, and authorize the advertisement for bids for polemount and padmount transformers for the Electric Utility Department.

BACKGROUND INFORMATION: Manufacturers of distribution transformers are reporting delivery lead-times in excess of forty weeks for certain types of polemount and padmount units used in the City's electric system.

It is therefore necessary to solicit bids for the Department's anticipated needs for mid-2007.

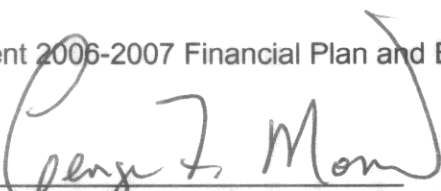
Staff recommends advertisement for bids for the following transformers:

Polemount: 9 ea 37.5kVA single-phase circuit protected 120/240V secondary
13 ea 50kVA single-phase circuit protected 120/240V secondary
5 ea 25kVA single-phase conventional 120/240V secondary

Padmount: 1 ea 150kVA three-phase 208Y/120V secondary
1 ea 225kVA three-phase 480Y/277V secondary
3 ea 500kVA three-phase 480Y/277V secondary

FISCAL IMPACT: Initial cost (estimated \$80,000, payment after delivery) is expected to be recovered through future power sales.

FUNDING: Electric Utility Department 2006-2007 Financial Plan and Budget.


George F. Morrow, Electric Utility Director

Prepared by Joel Harris, Purchasing Officer
cc: Electrical Engineer, EUD

APPROVED: 
Blair King, City Manager

4.000 GENERAL REQUIREMENTS

Electrical design and materials shall conform to the latest EEI-NEMA and ANSI Standards. It is the intent of these specifications to describe equipment of the best design and construction, for the service for which it is intended. Consequently, it shall be the City's desire to award contracts to the bidder who has demonstrated high quality by having a considerable number of transformers of bidder's manufacture in service on the lines of electrical utilities over a period of years.

4.001 TESTS

Transformers shall receive at least the following tests in accordance with the applicable ANSI and NEMA Standards:

- | | |
|---------------------------|--|
| (1) Load and no-load loss | (5) Applied and induced potential test |
| (2) Exciting current | (6) Impulse voltage test |
| (3) Polarity Check | (7) Tank pressure test |
| (4) Ratio check | |

4.002 SERVICE

The manufacturer shall own and operate a service shop in this vicinity, or the bidder may submit evidence of a repair contract with an approved service shop in this vicinity, which has been in effect for a period of at least one year. (For the purpose of this specification, "vicinity" shall mean within a 200-mile radius of the City of Lodi).

4.003 GUARANTEE

The Manufacturer shall guarantee all equipment delivered under these specifications against any and all defects in material and/or workmanship for a period of at least one year from date of acceptance. Manufacturer shall rectify all such defects by repair or replacement at manufacturer's sole expense and shall assume responsibility for associated shipping costs.

4.004 TECHNICAL INFORMATION

The following specifications shall be met:

1. **Insulation level:** 95 kV BIL (min).
2. **Insulation rating:** 65° C rise.
3. **Paint:** All exterior surfaces shall be painted ANSI 70 gray, using a system of coordinated and thoroughly tested materials and application techniques that will assure long life. Special attention shall be given to welds, seams, edges and rough spots.
4. **Lifting Lugs:** Lifting lugs shall be provided on the tank and shall be located in such a way to avoid interference between lifting slings and any attachments on the transformer and to avoid scratching the transformer coating.

5. **Tank:** Tanks shall be tested at a pressure equal to or greater than the maximum operating pressure and for a sufficient period of time to insure that all welds are free from leaks. Tank construction shall be consistent with good manufacturing and design practices prevalent in the transformer industry, and together they should contribute to a high quality product.
6. **Nameplates:** Stainless steel or anodized aluminum nameplate shall be securely attached to the transformer by means of metal screws, rivets or similar mechanical device(s). The letters and numbers shall be stamped or engraved on the nameplate. The nameplate shall include the words; "Fluid is less than one p.p.m. PCB," (refer to Section 4.006). The instruction nameplate shall contain the information specified in Section 5.12 of ANSI Standard C57.12.00-1993, or latest revision.
7. **Sound level:** The sound level shall be equal to or better than EEI-NEMA Standards.
8. **Size:** Size of the transformer, including radiators (fins), shall not interfere with installation or G.O. 95 requirements when banked together on cluster bracket (Dixie Electric P-538 or approved equal).
9. **Pressure Relief Valve:** The pressure relief valve shall be located a minimum horizontal distance of four (4) inches from the vertical centerline of the transformer hanger brackets.
10. **Height and Weight:** Height and weight of the transformer shall be as listed below:

Size (kVA)	Maximum Weight (lbs.)	Maximum Height (inches) including bushings
15	400	45
25	500	45
37.5	625	48
50	800	51
75	1,100	51
100	1,200	51
167	1,600	51

4.005 LOSSES

Losses will be considered in the evaluation of this bid as follows:

No-load (core) loss @ \$3.75/watt
Load (winding) loss @ \$1.25/watt

The cost of losses will be added to the equipment price (bid price) F.O.B. Lodi, including maximum escalation and tax, to determine the evaluated low bid of vendor otherwise meeting these specifications. All bidders shall supply the following guaranteed loss data for use in the evaluation, in addition to other data listed in the specifications:

1. No-load losses in watts at rated secondary voltage.
2. Load losses in watts at rated secondary voltage and rated load. The standard reference temperature for load loss shall be 85° C.

3. Upon request, furnish certification/statement of the guaranteed loss measurement error of the test equipment and measurement method to be used, including the basis for determination of the accuracy of the test equipment and measurement method.

The successful bidder shall supply a certified test report of actual losses of the unit(s) to be supplied. The no-load and load losses for each group (type and size) of transformer(s) will be averaged separately within their respective categories (no-load and load losses). If the averaged tested no-load (core) and/or load (winding) losses of the transformer group exceed the watt losses quoted in the proposal, the contract price shall be reduced by the above amounts per watt of actual group averaged no-load and/or actual load loss in excess of that quoted in the proposal. No-load loss penalties will be evaluated separately from load loss penalties. No additional payment will be made to the manufacturer or bidder for actual losses lower than the losses quoted in the proposal.

Certified test report of losses shall be submitted by the manufacturer prior to or at the time of shipment of the transformer.

4.006 PCB CONTENT

Transformer fluid shall be guaranteed to contain less than one p.p.m. by weight (mg/kg) polychlorinated biphenyls (PCB). Certified test report of PCB content shall be produced upon request. The transformer nameplate shall include the words; "Fluid is less than one p.p.m. PCB."

4.007 INSULATING FLUID

1. **Type:** The transformers shall be shipped completely filled with insulating fluid (oil). The oil shall be inhibited, prepared, and refined such that it is compatible with existing acid refined oils and with other oils available at the time of delivery. The oil shall be a Type II, antioxidant, inhibited mineral oil (minimum) meeting ANSI/ASTM D3487, latest revision.
2. **MSDS:** Material Safety Data Sheets (MSDS) shall be submitted with each shipment of transformers. The manufacturer/bidder shall indicate the transformer serial number(s) for which the MSDS is applicable.

4.100 SINGLE PHASE UNITS

4.101 GENERAL

In addition to that specified in Sections 4.000-4.007, transformers shall be provided with the following:

1. High Voltage Bushings (Porcelain):
 - a. Quantity: Two
 - b. Bushing terminals to be clamp-type suitable for use with copper and aluminum conductor.
2. Low Voltage Bushings:
 - a. Quantity: 277-volt: Two
All others: Three
 - b. Shall be tank wall-mounted.
 - c. Bushing terminals: 100 kVA and lower: Shall be clamp-type suitable for use with copper and aluminum conductor. Over 100 kVA: Shall be NEMA-4 pads (4-hole)

3. Pressure relief valve: Qualitrol 202-030-01, or an approved equal.
4. Lifting lugs shall be welded to the tank.
5. Provide tank grounding pad and a visible tank-to-cover ground strap.
6. Hanger brackets, welded to the tank.
7. Hanger brackets shall permit bolting of transformer directly to pole.
8. Single phase, 60Hz, OISC.

4.102 RATINGS AND DESIGN

Transformers shall have the following ratings and design:

1. Distribution type, pole-bolted transformer.
2. 12,000-Volt Delta primary.
3. Single phase.
4. Without arresters and taps.
5. Conventional or CP type as specified on proposal form. CP transformers to have one weak link (fuse) per primary bushing and a breaker on the secondary side.
6. Secondary voltage to be as specified on the proposal form.
7. kVA rating to be as specified on the proposal form.

4.000 GENERAL REQUIREMENTS

Electrical design and materials shall conform to the latest EEI-NEMA and ANSI Standards for Oil-Filled Equipment. It is the intent of these specifications to describe equipment of the best design and construction, for the service for which it is intended. Consequently, it shall be the City's desire to award contracts to the bidder who has demonstrated high quality by having a considerable number of transformers of the bidder's manufacture in service on the lines of electrical utilities over a period of years.

4.001 TESTS

Transformers shall receive at least the following tests in accordance with the applicable ANSI and NEMA Standards:

- | | |
|--------------------------|---------------------------------------|
| 1. Load and No-load loss | 5. Applied and induced potential test |
| 2. Exciting current | 6. Impulse voltage test |
| 3. Polarity check | 7. Tank pressure test |
| 4. Ratio check | |

4.002 SERVICE

The manufacturer shall own and operate a service shop in this vicinity, or the bidder may submit evidence of a repair contract with an approved service shop in this vicinity, which has been in effect for a period of at least one year. (For the purpose of this specification, "Vicinity" shall mean a 200-mile radius of the City of Lodi).

4.003 GUARANTEE

The manufacturer shall guarantee all equipment delivered under these specifications against any and all defects in material and/or workmanship for a period of at least one year from date of acceptance. The manufacturer shall rectify all such defects by repair or replacement at the manufacturer's sole expense and shall assume responsibility for associated shipping costs.

4.004 TECHNICAL INFORMATION

1. **Insulation level:** 95 kV BIL (min.).
2. **Insulation rating:** 65° C rise.
3. **Ground lugs:** Two (2) ground lugs which accepts a range of #4 to 1/0 AWG copper shall be provided.
4. **Paint:** The coating system shall be in accordance with ANSI C57.12.28, latest revision. The finish color shall be Munsell Green No. 7GY3.29/1.5 (olive). Special attention shall be given to welds, seams, edges and rough spots.
5. **Lifting lugs:** Lifting lugs shall be provided on the tank and shall be located in such a way to avoid interference between lifting slings and any attachment on the transformer and to avoid scratching the transformer coating. On single phase units, the lifting lugs may be removable.

6. **Tanks:** Tanks shall be tested at a pressure equal to or greater than the maximum operating pressure and for a sufficient period of time to insure that all welds are free from leaks. Tank and radiator construction shall be consistent with good manufacturing and design practices prevalent in the transformer industry, and together they should contribute to a high quality product.
7. **Nameplates:** Stainless steel or anodized aluminum nameplate shall be securely attached to the transformer by means of metal screws, rivets or similar mechanical device(s). The letters and numbers shall be stamped or engraved on the nameplate. The nameplate shall include the words, "Fluid is less than one p.p.m. PCB, at time of manufacture", refer to section 4.006. The instruction nameplate shall contain the information specified in Section 5.12.2 of IEEE (ANSI) C57.12.00, latest revision. Bushing and fuse designations shall be marked by stenciled lettering on the tank. Decals will not be accepted.
8. **Sound level:** The sound level shall be equal to or less than that specified in EEI-NEMA Standards.

4.005 LOSSES

1. **No-load:** No-load (core) loss @ \$3.75/watt
2. **Load:** Load (winding) loss @ \$1.25/watt
3. **Evaluation:** The cost of losses will be added to the equipment price (bid price) F.O.B. Lodi, including maximum escalation and taxes, to determine the evaluated low bid of vendor otherwise meeting these specifications.
4. **Guaranteed Loss Data:** Bidders shall supply the following guaranteed loss data for use in the evaluation, in addition to other data listed in the specifications:
 - A. No-load losses in watts at rated secondary voltage.
 - B. Load losses in watts at rated secondary voltage and rated load. The standard reference temperature for load losses shall be 85° C.
 - C. Upon request, furnish certification/statement of the guaranteed loss measurement error of the test equipment and measurement method to be used, including the basis for determination of the accuracy of the test equipment and measurement method.
5. **Certified Test Report:** The successful bidder shall supply a certified test report of actual losses of the unit(s) to be supplied. The no-load and load losses for each class (type and rating) of transformer(s) will be averaged separately within their respective categories (no-load and load losses). If the average tested no-load (core) and/or load (winding) losses of the transformer class exceed the watt losses quoted in the proposal, the contract price shall be reduced by the above amounts per watt of actual class averaged no-load and/or actual load losses in excess of that quoted in the proposal. No-load loss penalties will be evaluated separately from load loss penalties. No additional payment will be made to the manufacturer or bidder for actual losses lower than the losses quoted in the proposal.
6. **Certified Test report of Losses:** The manufacturer shall submit certified test reports of losses prior to or at the time of shipment of the transformers.

4.006 PCB CONTENT

Transformer fluid shall be guaranteed to contain less than one p.p.m. by weight (mg/kg) polychlorinated biphenyls (PCB). Certified test report of PCB content shall be produced upon request. The transformer nameplate shall include the words, "Fluid is less than one p.p.m. PCB at time of manufacture".

4.007 DIMENSIONS and DRAWINGS

The overall dimensions of the units (height, width, depth – height only for single-phase units) will be considered in the evaluation of the bid. For three-phase units, the bidder shall submit drawings of the units proposed in the bid.

4.008 LABELING

The transformers shall be shipped without the Safety Labels per NEMA No. 260-1991. The City will affix its personalized "Mr. Ouch" label(s).

4.009 INSULATING FLUID

1. **Type:** The transformers shall be shipped completely filled with insulating fluid (oil). The oil shall be inhibited, prepared, and refined such that it is compatible with existing acid refined oils and with other oils available at the time of delivery.
The oil shall be a Type II, antioxidant, inhibited mineral oil (minimum) meeting ANSI/ASTM D3487, latest revision.
2. **MSDS:** Material Safety Data Sheets (MSDS) shall be submitted with each shipment of transformers. The manufacturer/bidder shall indicate the transformer serial number(s) for which the MSDS is applicable.

4.010 PADMOUNT EQUIPMENT ENCLOSURES

A typical padmount equipment enclosure consists of a surrounding case or housing for the equipment to prevent unauthorized access, to protect people against accidental contact with energized parts and to protect equipment against weather hazards. The enclosure is mounted on a pad, above ground level, and may be ventilated to permit circulation of air.

Entry into the enclosure shall be through either access door(s) or hood(s) as specified.

1. **Structural Strength and Integrity Test:** The structural strength and integrity test shall comply with the latest NEMA and ANSI Standards for testing, design and enclosure security.
2. **Construction shall be such that:**
 - A. It prevents the entry of foreign objects, such as sticks, rods or wires.
 - B. It inhibits dismantling of the equipment.
 - C. It is free of areas which could provide access by forcing techniques.

- D. Panels shall be fastened or hinged to resist disassembly, breaking or prying open from the outside. Normal entry shall be possible only with the use of proper access tools. Latches and other provisions for locking hinged panels shall be furnished.
- E. There shall be no exposed screws, bolts or other fastening or hinging devices which are externally removable (with the exception of penta head bolts provided for extra security) that would provide access to energized parts of the enclosure.
- F. The transformer tank and enclosure shall be constructed of minimum 14 gauge steel. The radiator(s) to be constructed of minimum 18 gauge steel.
- G. In addition to the regular locking provisions, all access doors shall be secured by a recessed, captive, penta head bolt. A penta head bolt will be considered "captive" when the retention scheme will prevent it from being readily removed during normal operation of the door(s) or hood(s). The recess is to be non-rotating. The dimensions of the penta head bolt and non-rotating recess shall comply with Figure 1 of ANSI C57.12.28, latest revision. If all doors can be secured with a single bolt, one bolt will be sufficient.
- H. Each latched door(s) shall be latched at a minimum of three points. In addition to the three point latching, one penta head bolt shall be coordinated with the latch and padlock to prevent unlatching and insertion of the padlock into the hasp when and until the bolt head is completely seated. Low profile cabinets, with access flip-up hoods, need only padlock and penta head bolt provisions, and shall be coordinated to prevent insertion of the padlock into the hasp until the bolt head is completely seated.
- I. The padlocking device shall be so designed and located as to resist prying or breaking off by screwdrivers, wrecking bars, tire irons, single-socket lug wrenches or other readily accessible tools.
- J. The edges of the access doors or hoods shall be formed to provide: a) close fitting mating surface, with internal insertion prevention lip and b) rigid panel which, in conjunction with a handle-linkage-latching mechanism with three (or more) point latching, will resist bending in the event sufficient force is applied to distort the compartment door(s) and permit prying access to the door edges.
- K. Hinge pins shall be passivated AISI (American Institute of Steel Industries) Type 304 stainless steel, or approved equal.
- L. Handhole covers, if exposed when the enclosure is secured, shall be secured from the inside of the enclosure.
- M. The bottom edge of the enclosure shall provide for flush mounting on a flat, rigid mounting surface to prevent wire entry into the compartment.

4.011 FUSES

The transformers shall be fused with RTE® Bay-O-Net fuse assemblies and in series Isolating Links. The fuse and link sizes are shown in tables A and C, respectively, for single-phase and three-phase units. The Bay-O-Net assembly shall be Cooper Power Systems with Flapper™ valve or ABB "DO III" with vent hole and check valve.

An oil drip system similar to RTE® drip guard or a metal tray mounted on the tank wall below the fuse holder entrance shall be supplied. The metal tray shall be designed such that any insulating fluid captured in the tray will not drain onto bushings and/or cable assemblies located below the drip tray. Fastening of an oil drip device to the fuse assembly with a “U” bolt is not acceptable. Fuse element(s) shall not be installed, but supplied in a bag attached to the fuse holder handle. If the manufacturer desires to install the fuse(s) an additional fuse(s) of the size and type specified shall be supplied in a bag attached to the fuse holder handle.

4.012 PRESSURE RELIEF DEVICE

An automatic pressure relief device shall be provided, having the characteristics and installed in accordance with ANSI C57.12.26, latest revision.

4.100 SINGLE PHASE UNITS

Does not apply to this bid.

4.200 THREE PHASE UNITS

4.201 ENCLOSURE

Transformer enclosure to be in conformance with section 4.010, of this specification.

Maximum transformer height shall not exceed values listed in Table B, below.

High and low voltage compartments shall be separated, the low voltage compartment door shall be equipped with a locking handle. In addition, the doors shall be so arranged that access to the high voltage compartment can be gained only after opening the low voltage compartment door. The doors shall be removable.

Cables shall enter and leave the transformer from below through openings in a concrete pad.

Table B
Transformer Height

Transformer kVA	Height (maximum) Inches
300 kVA and below	65
500 kVA	75
750 kVA and above	90

4.202 TERMINALS

Primary: Primary bushing and parking stand positions shall be in accordance with ANSI Standard C57.12.26, Figure 1, latest revision.

Secondary:

1. The low voltage bushing arrangements and clearances shall be in accordance with ANSI Standard C57.12.26, latest revision, Figure 8a (Staggered Low-Voltage Terminal Arrangement). For units 225 kVA and below, Figure 4a is acceptable.
2. The neutral terminal shall be a fully insulated bushing.
3. Low voltage terminals on units rated 300 kVA and above shall be equipped with bushing supports. The bushing supports shall be attached to the end of the spade. The support shall not hinder or interfere with any cable lugs to be attached to the spade at any of the hole locations.
4. The low voltage terminals shall be NEMA spade terminals per ANSI Standard C57.12.26, latest revision, Figure 9a, 9b, 9c or as specified below:

225 kVA units and below: four (4) hole NEMA spade terminals.

300 kVA units: six (6) hole (minimum) supported NEMA spade terminals.

500 kVA units: eight (8) hole (minimum) supported NEMA spade terminals.

750 kVA units and above: ten (10) hole supported NEMA spade terminals.

4.203 STANDARD ACCESSORIES

In addition to that specified in sections 4.000 – 4.012, of this specification, the transformers shall be provided with the following:

1. Pressure relief valve.
2. Liquid level gauge, drain valve with sample valve and oil filler plug. Drain valve to be located in the high voltage compartment.
3. Parking stands (3) for each high voltage elbow terminator.
4. Three (3) high voltage universal bushing wells. The bushing wells shall comply with all applicable requirements of ANSI/IEEE 386, latest revision, and shall be fixed stud type.
5. Bay-O-Net fuse assembly and Isolation link (see Table C below for ratings).

4.204 IMPEDANCES

Transformer impedances shall not be less than the following:

150 kVA and below	2.0 %
225 kVA and 300 kVA	3.5 %
500 kVA	4.0 %
750 kVA and above	5.3 %

4.205 RATINGS AND DESIGN

1. Dead front, radial feed with three (3) universal bushing wells.
2. Voltage: 12,000 volt Delta connected primary.
3. Single-phase, 60 Hz, OISC.
4. 500 kVA and larger units only:
 - A. On-Off loadbreak, gang operated, oil immersed switch.
 - B. Switch handle with eye for operation with hot stick shall be located in high voltage compartment.
5. Transformers shall be provided with RTE dual sensing Bay-O-Net #4000358C() or current sensing #4000353C() or approved equal fuse links and Isolation links in accordance with Table C.
6. kVA rating to be as specified on proposal form.
7. Secondary voltage rating to be as specified on proposal form.

4.206 FUSE LINKS

Table C
Fuse Links (Three-Phase)

Transformer kVA	Designation Dual Sensing 4000358C()	Bay-O-Net Link Rating (Amp)	Isolation Link 3001861A()
75	05	8	02M
112.5	08	15	03M
150	08	15	03M
225	10	25	05M
300	10	25	05M
500	12	50	06M
	Designation Current Sensing 4000353C()		
750	14	65	05M
1000	16	100	05M
1500	17	140	05M

End of Section 4